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Sir:
Transmitted herewith for filing is the patent application of Inventor(s):

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For: METHOD AND APPARATUS FOR PROCESSING CONTROL MESSAGES IN A COMMUNICATIONS SYSTEM

Enclosed are also:

X	18	Pages of Specification including an Abstract
X	6	Pages of Claims
X	3	Sheet(s) of Drawings
X		A Declaration and Power of Attorney

CLAIMS AS FILED

FOR	Number Filed		Number Extra		Rate		Basic Fee ($690)
Total Claims	28	-20 =	8	X	$ 18	=	$144
Independent Claims	8	-3 =	5	X	$ 78	=	$390
Multiple Dependent Claims	0			X	$260	=	$0
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X A check in the amount of $1,224 is enclosed for the filing fee.

X The Commissioner is hereby authorized to charge payment of the following fees associated with the communication or credit any over payment to Carstens, Yee & Cahoon, Deposit Account No. 50-0392. A duplicate copy of this sheet is enclosed.

X Any additional filing fees required under 37CFR § 1.16.

X Any patent application processing fees under 37CFR § 1.17.

Respectfully,

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METHOD AND APPARATUS FOR PROCESSING CONTROL MESSAGES IN A COMMUMICATIONS SYSTEM

1. Field of the Invention:

The present invention relates to an improved communications system and in particular to a method and apparatus for processing control messages in a communication system. Still more particularly, the present invention provides a method and apparatus for processing control messages through a packet-based portion of a communications system.

2. Background of the Invention:

Voice communications over packet-based networks are becoming more common within communications systems. Currently, many of these networks are Internet Protocol (IP) networks. These voice communications are referred to as voice over IP or VoIP. The use of these networks for communications takes advantage of resources already in place. Further, companies with Internet systems also may implement voice over IP communications using their existing network systems. Further, in addition to voice, the presence of a packet-based network allows for various services to be offered based on the packet-based technologies, such as, for example, providing e-mail messages and documents across the same terminal device.

One problem with a packet-based network system used for voice is the fact that IP networks, such as the Internet, consists of multiple routers, which are linked together. These routers store the data packets and forward them to the most appropriate output links, which may range from 64 kilobits per second over a twisted pair to 155 megabits per second or greater over fiber based links.

IP is a datagram-based approach and offers no guarantee of quality. For example, network delay may be variable depending on the traffic within the network. In an IP network, packets are self-steering and dependant on the IP address. As a result, packets may take different routes depending on how busy

each router is within a network. In contrast, with a fixed circuit, the delay is fixed and known. A further problem with IP networks is that depending on the traffic within a network, packets may be dropped. For transmission of data, packets may be resent. As a result, the packets retransmitted are delayed more than other packets taking the same route, which are not dropped. This retransmission mechanism is appropriate for applications, which are insensitive to delays. These mechanisms are commonly used in applications, such as, for example, Web browsers and e-mail programs.

On the other hand, with delay sensitive applications, variable delays and dropping of packets are undesirable. When the delay sensitive application includes transmitting voice data, variable delay or dropping of packets is unacceptable to maintain an appropriate quality of service for a call. Another instance in which the unpredictable delay or dropping of packets is unacceptable occurs as with control messages used to set up, manage, and terminate a session for a call. Currently, no mechanism is present for handling control messages over a packet-based network to guarantee delivery of these messages.

Therefore, it would be advantageous to have an improved method and apparatus for handling control messages in an IP communications system.

SUMMARY OF THE INVENTION

An improved method and apparatus for handling control messages is provided in which priority or preferential processing of these control messages occurs within a packet-based portion of a communications system. More specifically, the present invention provides a method in a communications system for processing control messages for a session in a packet-based network within the communications system. A priority indicator is placed in a control message handling a session within the communications system through the packet-based network. Applications handling control messages in the packet-based network will provide priority or preferential handling of the control message containing the priority indicator.

In the depicted examples, some nodes contain applications, which handle control messages, while other nodes only handle packets transporting the control messages and do not process the control messages themselves. In this case, another indicator also may be placed in the header of a packet transporting the control message. This indicator is used by nodes, which handle the packets to provide priority processing of the packets in these nodes. In this manner, the control message may be given priority handling even in nodes in which an application handling control messages is absent. Thus, priority handling of the control message is provided within the packet-based network within the communications system.

Other aspects and features of the present invention will become apparent to those ordinarily skilled in the art upon review of the following description of specific embodiments of the invention in conjunction with the accompanying figures.

BRIEF DESCRIPTION OF THE DRAWINGS

The novel features believed characteristic of the invention are set forth in the appended claims. The invention itself, however, as well as a preferred mode of use, further objectives and advantages thereof, will best be understood by reference to the following detailed description of an illustrative embodiment when read in conjunction with the accompanying drawings, wherein:

Figure 1 is a diagram of a communications system in accordance with the preferred embodiment of the present invention;

Figure 2 is a blocked diagram illustrating control message flow in accordance with a preferred embodiment of the present invention;

Figure 3 is a diagram of control message flow through packet-based routers in accordance with a preferred embodiment of the present invention;

Figure 4 is a block diagram of a node in which the present invention may be implemented in accordance with a preferred embodiment of the present invention;

Figure 5 is a diagram of a protocol stack in accordance with preferred embodiment of the present invention;

Figure 6 is a diagram control message depicted in accordance with a preferred embodiment of the present invention;

Figure 7 is a diagram of an IP packet in accordance with a preferred embodiment of the present invention;

Figure 8 is an example of a priority AVP format in accordance with a preferred embodiment of the present invention;

Figure 9 is a flowchart of a process for generating a control message in accordance with a preferred embodiment of the present invention; and

Figure 10 is a flowchart of a process used to process control messages in accordance with a preferred embodiment of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

With reference now to the figures and in particular with reference to **Figure 1,** a communications system is illustrated in accordance with a preferred embodiment of the present invention. In this example, communications system **100** includes a visitor access provider network **102**, home access provider network **104**, home Internet Protocol (IP) network **106**, authentication, authorization, and accounting (AAA) broker network **108**, home access provider network **110**, SS7 network **112,** IP network **114**, and public switched telephone network (PSTN) **116**.

AAA broker network **108** includes AAA services. These AAA services consist of authentication, authorization, and accounting services. The authentication services are used to verify the identity of an entity. Authorization is a service used to determine whether the requesting entity is allowed access to a resource. Accounting services collect information on resource usage for purposes, such as trend analysis, auditing, billing, or cost allocation.

SS7 network **112** is a signaling system number 7 network used for switching data messages used for connecting calls and maintaining the signaling network itself. SS7 network **112** is designed for use with voice networks, such as PSTN **116**. IP network **114** and PSTN network **116** are both used for carrying voice calls from visitor access provider network **102** to some destination in this example. The destination may be somewhere within PSTN **116** or to HA **110**.

In **Figure 1**, visitor access provider network **102** includes a mobile station **118**, a radio network **120**, a visitor location register (VLR) **122**, a visited AAA server **124**, and a foreign agent (FA) functionality **128**, which is hosted on a device or platform. In this example, radio network **120** may take various forms, such as, for example, time division multiple access (TDMA) or code division multiple access (CDMA) cellular system. Of course, radio network **120** may be implemented using any type of radio system. A call may be initiated or terminated at mobile station **118** through radio network **120**. The route of a call

may pass through PSTN **116** or IP network **114**. If the call is to be placed in packet form, FA functionality **128** handles the transmission of these packets. FA Functionality provides routing services to mobile station **118**. Often times, this functionality is embodied in a router on the visited network of mobile station **118**. More information on FA functionality may be found in RFC 2002, entitled *IP Mobility Support*, which is available from the Internet Engineering Task Force (IETF). The setting up, terminating, and management of the call may be handled through SS7 network **112**, VLR **122**, and home location register (HLR) **126**. This setting up, terminating, and management is also just referred to as managing or handling. VLR **122** is used to store subscriber information for a subscriber in a particular service area, such as within visitor access provider network **102**. This information may be obtained from HLR **126**, which is a functional unit used for managing mobile subscribers through maintaining all subscriber information. Thus, when a subscriber using a mobile station, such as mobile unit **118**, travels from one service area to another, the information from HLR **126** may be sent to the VLR for that particular service area. All of the signaling and control messages are handled through SS7 network **112**, while the voice data for the call is handled through PSTN **116**.

With packet-based calls, such as voice over IP, the messaging and the voice data are both passed through IP network **114**. In this case, visited AAA server **124** and FA functionality **128** provide a similar function to VLR **122** within visitor access provider network **102**. In this case, the control messages, such as a registration request generated by mobile station **118,** will be forwarded to FA functionality **128**. FA functionality **128** will then send these messages to HA **110** through IP network **114**. FA functionality **128** may also send the AAA messages to visited AAA server **124** and which in turn forwards them to home AAA server **129** via IP network **114**. In this example, FA functionality **128** is also referred to as the home AAA server. Home AAA server **129** within home IP network **106**, AAA server **130** within AAA broker network **108**, and visited AAA server **124** provide functions similar to FA functionality **128**, VLR **122**, and HLR **126**.

A mechanism for handling control messaging through IP network **114** is used in accordance with the preferred embodiment of the present invention. This mechanism provides a priority or precedence mechanism for the handling of control messages by various nodes within IP network **114**. This mechanism is used for all control messaging related to a session for a call. A session is the active connection between two nodes used in a call. These messages are for different functions, such as, for example, those used for IP mobility including handoffs, registrations, and AAA functions. IP mobility allows for a mobile station, such as mobile station **118** to travel from network to network in different service areas and still have an uninterrupted connectivity. For example, mobile station **118** has a home network, home access provider network **110**, and is currently located in visitor access provider network **102**. The control messaging used for registering mobile station **118** within visitor access provider network **102** and for handling calls initiated from and terminated to mobile station **118** is provided priority or precedence over other types of messages transported through IP network **114**. The priority is assigned to this kind of messaging because control messages are handled by delay sensitive applications. Radius and diameter are examples of applications containing control messaging functions. AAA broker network **108**, in this example, provides address resolution service to the visited networks that do not have a service level agreement with a particular home network. AAA broker network **108** also may provide security parameters for establishing sessions between visited and home networks. These applications include, for example, those found in home AAA **129**, AAA server **130** and visitor AAA **124**.

Communications system **100** is an exemplary communications system in which the present invention may be implemented. The illustration is not meant to imply architectural limitation to the present invention. Other types of inventions may be used in place of those illustrated.

Turning next to **Figure 2**, a blocked diagram illustrating control message flow is depicted in accordance with a preferred embodiment of the present invention. In this example, control messages are generated by home AAA server

200 for receipt and use by visited AAA server **202**. Home AAA server **200** may be, for example, home AAA server **129** in **Figure 1** while visited AAA server **202** may be visited AAA server **124** in **Figure 1**. Home AAA server **200** may be providing control messages relating to authentication, authorization, or accounting to visitor server **202**. In this case, these control messages are for the delay sensitive applications, such as voice/video streaming. A priority indicator is placed into each of the control messages sent from home AAA **200** to visited AAA server **202**. These control messages are routed through a path including AAA server **204** and AAA server **206**. The applications (i.e., radius and diameter) in these servers will route the control messages to visitor server AAA **202**. In routing the control messages, the messages are examined to see whether an indicator has been sent within the control message. If the priority indicator is set in the control message, the message is handled accordingly. The indicator in a message may contain different levels of priority, such as, for example, 1, 2, 3, and 4 with 1 having the highest priority. Alternatively, other types of indicators may be used, such as platinum, gold, silver, and bronze with platinum having the highest priority. Control messages having higher priority indicators will be processed or routed prior to control messages having lower level indicators or no indicators at all.

In the depicted example, messages are placed in a queue for processing. Typically, messages are processed in a first-in-first-out (FIFO) basis. When priority indicators are used, exceptions to FIFO processing are made. Messages having a priority indicator are placed ahead of messages without a priority indicator in the queue. With multiple or different levels of priority, messages having higher priority levels are placed ahead of messages with lower priority levels in the queue.

Turning next to **Figure 3**, a diagram of control message flow through packet-based routers is depicted in accordance with a preferred embodiment of the present invention. In some cases, control messages may be routed through nodes, which do not contain applications to control the flow of control messages. For example, within an IP network, such as IP network **114** in **Figure 1**, messages

may be placed into IP packets for routing from a source to a destination through a number of different nodes, such as routers. These routers do not examine the control messages themselves, but route the data based on the headers in the IP packets. In this example, IP layer **300** generates IP packets containing data for control messages and sends them to IP layer **302**. These IP layers may be located in a home AAA server and a visited AAA server, such as home AAA server **129** in **Figure 1** and visited AAA server **124** in **Figure 1**.

In this case, the path between these servers passes through router **304** and router **306**. These routers do not examine the control messages, but process the IP packets based on the information in the headers of the IP packets. In such as case, IP layer **300** is instructed through a call or some other mechanism to set an indicator to provide priority handling of the IP packets. When an IP packet is received by router **304** or router **306**, the header of the IP packet is examined. In addition to identifying where to send the IP packet, a determination is made as to whether an indicator is set in the header of the IP packet to identify whether the IP packet is to be given priority in processing. If an indicator is set in the header, then that IP packet is processed prior to other IP packets without the indicator. For example, an IP packet containing the indicator will be placed in a processing queue prior to other packets without an indicator.

In this manner, priority handling of packets containing control messages may be obtained even in nodes, which do not contain applications that examine the control messages themselves.

Turning next to **Figure 4**, a block diagram of a node in which the present invention may be implemented is depicted in accordance with a preferred embodiment of the present invention. In this example, node **400** contains a bus **402** providing communication between processor unit **404**, memory **406**, communications adapter **408**, and storage **410**. Processor unit **404**, in this example, executes instructions, which may be located in memory **406** or storage **410**. Communications adapter **408** is used to send and received data, such as control messages. Node **400** may be used to implement different components of the present invention. For example, node **400** may be a router used to route IP

packets, an AAA server, or any other server or communications unit used to route or handle control messages within a packet-based network, such as IP network **114** in **Figure 1**.

The illustrated example in **Figure 4** is not meant to apply architectural limitation to the present invention. For example, although bus **402** is the depicted mechanism for providing communications between the components within node **400**, any other sort of interconnect or communications mechanism may be used to provide communications between the different components within node **400**.

Turning now to **Figure 5**, a diagram of a protocol stack is depicted in accordance with preferred embodiment of the present invention. In this example, protocol stack **500** includes an application layer **502**, a presentation layer **504**, a transport layer **506**, a network layer **508**, a data link layer **510**, and a physical layer **512**. In the depicted example, protocol stack **500** is located in a node with an application that handles control messages.

These layers follow the Open System Interconnection (OSI) standard defining a framework implementing protocols in seven layers. Control is passed from one layer to the next, starting at the application layer in one station or device, proceeding to the bottom layer, moving over a communications channel to the next station or device, and proceeding back up the hierarchy. Protocol stack **500** may be found in a node, such as visited AAA server **124**, HA **110**, or FA functionality **128** in **Figure 1**.

The mechanism of the present invention is implemented in application layer **502** and network layer **508** in these examples. An application program in application layer **502** may generate or receive control messages. When generating a control message, the application includes an indicator to provide priority processing by an application receiving the control message. Further, the application in the node generating the message may send a call or command to network layer **508** to provide for priority or precedence handling of IP packets containing the control message. In this example, network layer **508** includes an IP protocol. In response to receiving a request to provide priority or precedence handling for a control message being transported using one or more IP packets,

the headers of these IP packets will include an indicator used by other network layers located in nodes routing IP packets to provide priority or precedence in the processing of these IP packets.

In this manner, when control messages are routed by nodes that do not examine the control messages in routing the messages, priority in the handling of these messages is insured. In this manner, delays in the handling of control messages are reduced.

Turning next to **Figure 6**, a diagram of a control message is depicted in accordance with a preferred embodiment of the present invention. Control message **600** is an example of a control message generated by an application to handle a session for a call. These messages may be, for example, a message to set up a session, a message to terminate a session, and a message to authenticate/authorize a user. Examples of other control messages include, for example, accounting record messages and mobility management messages. Control message **600** includes a header **602** and a payload **604** in which attribute-value pairs (AVPs) are located. In this example, AVP **606** and AVP **608** are located within payload **604** of control message **600**. An AVP, in these examples, consists of three parts: an identifier, a length, and data. A unique AVP identifier is assigned to all data objects in order to be able to distinguish the data contained.

In this example, AVP **606** is a priority AVP used to provide priority or precedence for control message **600** in accordance with a preferred embodiment of the present invention. The present invention provides a new AVP identifier to indicate that the AVP is a priority AVP. Other AVPs that may be found within control message **600** include, for example, an IP address, an encryption code, an e-mail address, authentication parameters, and a user ID. With AVP **606**, applications processing the control messages will provide the appropriate priority for precedence for the message based on AVP **606**. In these examples, control messages, such as control message **600**, a placed into a queue for processing by an application. When AVP **606** is present, the control message is placed ahead of other control messages in the queue for processing. If multiple levels of priority

are present, the placement of the control message will be based on the priority in AVP **606** as compared to the priority of other messages in the queue.

A number of different types of AVPs, other than a priority AVP, may be located within payload **604**. In the depicted examples, these AVPs and the servers processing the AVPs follow the Diameter protocol. More information on the Diameter protocol may be found in draft-calhoun-diameter-framework-07.txt and draft-calhoun-diameter-14.txt from the IETF.

With reference next to **Figure 7**, a diagram of an IP packet is depicted in accordance with a preferred embodiment of the present invention. In this example, IP packet **700** is an example of an IP packet sent onto an IP network, such as IP network **114** in **Figure 1**. In this example, IP packet **700** includes a header **702** and a payload **704**. Payload **704**, in this example, contains an entire control message, such as control message **600** in **Figure 6**. Depending on the size of the control message, the control message may be placed into multiple IP packets for transmission on the IP network.

To provide for priority handling of the control message contained within IP packet **700** by nodes in which an application processing control messages is absent, an indicator is set within header **702** of IP packet **700**. In the depicted examples, a differential services (DS) field **706** is set to provide priority or precedence for the handling of IP packet **700** by nodes, which do not examine the control message in the processing of IP packet **700**. In accordance with a preferred embodiment of the present invention, this field is set by a network layer, such as network layer **508** in **Figure 5**, in response to a call from an application in an application layer within the protocol stack. In particular, DS field **706** is set to provide for priority or precedence handling of control messages placed into IP packets routed by nodes, such as routers, which do not examine the control message itself when routing the IP packets. When DS field **706** is set, a node receiving IP packet **700** will provide priority handling for the packet. In the depicted examples, packets, such as IP packet **700**, are typically placed into a queue for processing or routing to another node. The packets are processed using

a FIFO process. IP packet **700** is placed in the queue ahead of other packets in which a DS field is not set.

Turning now to **Figure 8**, an example of a priority AVP format is depicted in accordance with a preferred embodiment of the present invention. AVP **800** is an example of an AVP format used for a priority AVP. In this example, AVP **800** includes AVP code field **802**, which identifies the particular attribute. AVP code field **802** contains the appropriate code to identify AVP **800** as a priority AVP.

AVP length field **804** in this example is two octets and indicates the length of AVP **800**. In other words, AVP length **804** is used to identify when AVP **800** ends and another AVP begins. Reserved field **806** is reserved for other uses. Flags field **808** contains flags as described in the diameter based protocol. In this example, H and E may be set depending on the security model used, while M, V, T, and P are not set. Integer 32 field **810** contains the priority number of the issuing device. In particular, a number of different codes may be used in integer 32 field **810** to provide priority or precedence handling of the control message itself. For example, platinum, gold, silver, and bronze levels may be implemented. In such a case, platinum receives the highest priority while bronze receives the lowest priority. In the depicted examples, a single AVP code is used for all priorities, with the level of the priority being placed within the data section of the AVP.

Turning now to **Figure 9**, a flowchart of a process for generating a control message is depicted in accordance with a preferred embodiment of the present invention. The process illustrated in **Figure 9** may be implemented in an application layer, such as application layer **502** in **Figure 5**, for use in a server, such as visited AAA server **124** or home AAA server **129** in **Figure 1**.

The process begins by identifying time sensitive data in the message (step **900**). In this case, the control message itself is the time sensitive data. In response to identifying time sensitive data, a priority AVP is generated (step **902**). This priority AVP may be an AVP, such as AVP **800** in **Figure 8**. Next, the priority AVP is placed in the control message (step **904**). This priority AVP is the

priority indicator for the control message in this example. This priority AVP is a priority AVP, such as AVP **606** in **Figure 6**.

Additionally, a call is sent to an IP layer in the protocol to set the priority indicator (step **906**). In the depicted example, this call is made to a network layer, such as network layer **508** in **Figure 5**. The priority indicator set in response to this call is a priority indicator in a header of the packet used to transport the control message. In the depicted examples, this priority indicator is a DS field, such as DS field **706** in **Figure 7**. This call is used to provide priority handling of packets used to transport control messages. The setting of this indicator allows for priority handling of the packet in nodes, which do not examine control messages. In this manner, best efforts handling in the transport of the control message from a source to a destination is ensured even when the message is being transported through nodes, which do not look at the contents of the packets themselves. The control message is then sent for transport (step **908**) with the process terminating thereafter. This step involves sending the control message to the next layer in the protocol stack, such as a transport layer.

Of course, the application also may make additional calls or send additional messages to ensure that the control message reaches the target with minimal delay. For example, steps **910** and **912** are optional steps, which may be implemented in a system using resource reservation protocol (RSVP). If RSVP is used, the process in **Figure 9** also generates a reservation message (step **910**) and sends the reservation message (step **912**).

RSVP is a network-controlled protocol that enables Internet applications to obtain special qualities of service for data flow. Data flow occurs between two points, such as a source or sending host and a target or receiving host. RSVP works in conjunction with routing protocols and installs the equivalent of dynamic access list along the routes that routing protocols calculate or establish. RSVP data flows are generally characterized by sessions over which data-packets flow. A session is a set of data flows with the same uni-task or multi-task destination in these examples. A path message is a RSVP message sent by a sender or source forwarded along a uni-task or multi-task route provided by routing protocols

located in various nodes. The path message is used to store the path state in each node. The path data is used to route reservation messages in the reverse direction. With RSVP, bandwidth may be reserved in nodes, such as routers, for selected data flows to ensure that the data flow occurs without delay. RSVP typically is implemented in a transport layer, such as transport layer **506** in **Figure 5**. More information on RSVP may be found in RFC 2205, which is available from the IETF.

The setting of an indicator in the header of an IP packet and the use of a mechanism to reserve bandwidth for processing selected packets are intended as examples of mechanisms used to provide best efforts processing of control messages. These examples are not intended as limitations as to the types of mechanisms that may be used to ensure that control messages are processed as quickly as possible at nodes, including nodes routing packets containing control messages in which the control messages themselves are not examined.

Turning now to **Figure 10**, flowchart of a process used to process control messages is depicted in accordance with a preferred embodiment of the present invention. The process in **Figure 10** may be implemented in an application layer, such as application layer **502** in **Figure 5**. These processes may be used in a server, such as visited AAA server **124** or home AAA server **129** in **Figure 1**.

The process begins by receiving a control message (step **1000**). This control message is received after IP packets have received by a lower layer in the protocol and placed into a form for use by the application. The control message is parsed (step **1002**). A determination is made as whether a priority AVP is present within the control message (step **1004**). If a priority AVP is present, then the control message is processed based on a priority indicated in the AVP (step **1006**) with the process termination thereafter. If a priority AVP is absent in the control message, then the control message is processed normally (step **1008**) with the process terminating thereafter.

Priority in processing may be achieved by placing the control message or the data from the control message higher up in a queue or buffer for processing

with respect to other control messages in which priority is absent or in which priority is lower than that of the current control message.

A similar process is followed by router processing IP packets. Upon receiving an IP packet, the router examines the header to see whether an indicator is present or set for priority handling of the IP packet.

Thus, the present invention provides a priority based mechanism used to control messaging within a packet-based network, such as an IP network. In these examples, control messages are an example of messages containing time sensitive information that is sensitive to delays in delivery. The mechanism of the present invention allows for these types of control messages to be appropriately handled when received by different nodes, such as a router, a device/platform hosting FA functionality, an AAA broker, or an AAA server. The priority handling is provided through the setting of various indicators within the messages and packets by the application layer. In this manner, the processing of messages and IP networks may be handled more quickly to avoid delays in delivering data to delay sensitive applications.

It is important to note that while the present invention has been described in the context of a fully functioning data processing system, those of ordinary skill in the art will appreciate that the processes of the present invention are capable of being distributed in the form of a computer readable medium of instructions and a variety of forms and that the present invention applies equally regardless of the particular type of signal bearing media actually used to carry out the distribution. Examples of computer readable media include recordable-type media such a floppy disc, a hard disk drive, a RAM, CD-ROMs, and transmission-type media, such as digital and analog communications links.

The description of the present invention has been presented for purposes of illustration and description and is not intended to be exhaustive or limited to the invention in the form disclosed. Many modifications and variations will be apparent to those of ordinary skill in the art. For example, although the depicted examples use control messages, the processes of the present invention may be implemented for other types of data and messages other than control messages.

Further, the processes may be applied using other protocols other than those illustrated herein. The embodiment was chosen and described in order to best explain the principles of the invention, the practical application, and to enable others of ordinary skill in the art to understand the invention for various embodiments with various modifications as are suited to the particular use contemplated.

Docket No. 10592RRUS01U

EXPRESS MAIL NO. EL356872832US

CLAIMS:

What is claimed is:

1. A method in a communications system for processing control messages in a packet-based portion of the communications system, the method comprising:

placing a priority indicator in a control message to indicate to an application handling the control messages that the control message is to be given priority in processing; and

placing a priority indicator in a header of a packet transporting the control message within the packet-based portion of the communications system to indicate to a node receiving the packet that the packet is to be given priority in processing.

2. The method of claim 1, wherein the packet is an Internet Protocol packet.

3. The method of claim 1, wherein the node is one of a server, a router, and a device/host platform hosting foreign agent functionality.

4. The method of claim 1 further comprising:

sending a request to the node to reserve processing resources to process the packet.

5. A method in a communications system for processing control messages for a session in a packet-based network within the communications system, the method comprising:

setting an indicator for a control message handling the session within the communications system through the packet-based network; and

sending the control message to the packet-based network, wherein the packet-based network provides preferential processing of the control message in managing the session based on the indicator.

6. The method of claim 5, wherein the indicator is an attribute value pair located in the control message.

7. The method of claim 5, wherein the control message is transported through a plurality of nodes and further comprising setting a second indicator, wherein the plurality of nodes provide preferential handling of the control message based on the second indicator.

8. The method of claim 7, wherein the second indicator is a differential service bit in an Internet Protocol header in a packet transporting the control message.

9. The method of claim 5, wherein a set of nodes is configured to reserve bandwidth for processing selected messages and further comprising:

sending a message to the set of nodes to reserve the bandwidth for processing the control message.

10. The method of claim 5, wherein the set of nodes include at least one of a router, a server, and a device/host platform hosting foreign agent functionality.

11. The method of claim 5, wherein the control message is a message from a set of messages to establish the session, terminate the session, and manage the session.

12. A communications system comprising:

a packet-based network;

a plurality of nodes connected to the packet-based network; and

a source node, wherein the source node sends a control message to a target node through the plurality of nodes, the control message includes a priority indicator used to perform expedited processing of the control message within the plurality of nodes in which the priority indicator is set.

13. The communications system of claim 12, wherein the priority indicator is set for time sensitive information in the control message.

14. A node comprising:

a bus;

a communications adapter connected to the bus, wherein the communications adapter sends and receives messages to and from a packet-based network;

a memory connected to the bus, wherein the memory includes instructions for an application; and

a processing unit connected to the bus, wherein the processing unit executes a set of instructions to generate a control message for a session within an application at a remote node, place a priority indicator in the control message to indicate to an application handling the control messages that the control message is to be given priority in processing, and place a priority indicator in a header of a packet transporting the control message within the packet-based portion of the communications system to indicate to a node receiving the packet that the packet is to be given priority in processing.

15. A communications system for processing control messages in a packet-based portion of the communications system, the communications system comprising:

first placing means for placing a priority indicator in a control message to indicate to an application handling the control messages that the control message is to be given priority in processing; and

second placing means for placing a priority indicator in a header of a packet transporting the control message within the packet-based portion of the communications system to indicate to a node receiving the packet that the packet is to be given priority in processing.

16. The communications system of claim 15, wherein the packet is an Internet Protocol packet.

17. The communications system of claim 15, wherein the node is one of a server, a router, and a device/host platform hosting foreign agent functionality.

18. The communications system of claim 15 further comprising:

sending means for sending a request to the node to reserve processing resources to process the packet.

19. A communications system for processing control messages for a session in a packet-based network within the communications system, the communications system comprising:

setting means for setting an indicator for a control message handling the session within the communications system through the packet-based network; and

sending means for sending the control message to the packet-based network, wherein the packet-based network provides preferential processing of the control message in managing the session based on the indicator.

20. The communications system of claim 19, wherein the indicator is an attribute value pair located in the control message.

21. The method of claim 19, wherein the control message is transported through a plurality of nodes and further comprising a second setting means for setting a second indicator, wherein the plurality of nodes provide preferential handling of the control message based on the second indicator.

22. The method of claim 21, wherein the second indicator is a differential service bit in an Internet Protocol header in a packet transporting the control message.

23. The communications system of claim 19, wherein a set of nodes is configured to reserve bandwidth for processing selected messages and further comprising:

sending means for sending a message to the set of nodes to reserve the bandwidth for processing the control message.

24. The communications system of claim 19, wherein the set of nodes include at least one of a router, a server, and a device/host platform hosting foreign agent functionality.

25. The communications system of claim 19, wherein the control message is a message from a set of messages to establish the session, terminate the session, and manage the session.

26. A computer program product in a computer readable medium for processing control messages in a packet-based portion of the communications system, the computer program product comprising:

first instructions for placing a priority indicator in a control message to indicate to an application handling the control messages that the control message is to be given priority in processing; and

second instructions for placing a priority indicator in a header of a packet transporting the control message within the packet-based portion of the communications system to indicate to a node receiving the packet that the packet is to be given priority in processing.

27. A computer program product in a computer readable medium for processing control messages for a session in a packet-based network within a communications system, the computer program product comprising:

first instructions for setting an indicator in a control message handling a session within the communications system through the packet-based network; and

second instructions for sending the control message to the packet-based network, wherein the packet-based network provides preferential processing of the control message in managing the session based on the indicator.

28. The computer program product of claim 27, wherein a set of nodes is configured to reserve bandwidth for processing selected messages and further comprising:

third instructions for sending a message to the set of nodes to reserve the bandwidth for processing the control message.

Docket No. 10592RRUS01U

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EL356872832US

ABSTRACT OF THE DISCLOSURE

METHOD AND APPARATUS FOR PROCESSING CONTROL MESSAGES IN A COMMUMICATIONS SYSTEM

A method and apparatus in a communications system for processing control messages for a session in a packet-based network within the communications system. A first indicator is set in a control message for handling a session within the communications system through the packet-based network. The control message is sent to a destination within the packet-based network. The control message is provided priority processing within the packet-based network based on the presence of the first indicator. A second indicator is set in a header of a packet used to transport the control message, such that nodes within the packet based network, which do not examine the control message, provide priority processing of the packet in sending the packet through the packet-based network to the destination.

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Figure 1

10592RRUS01U

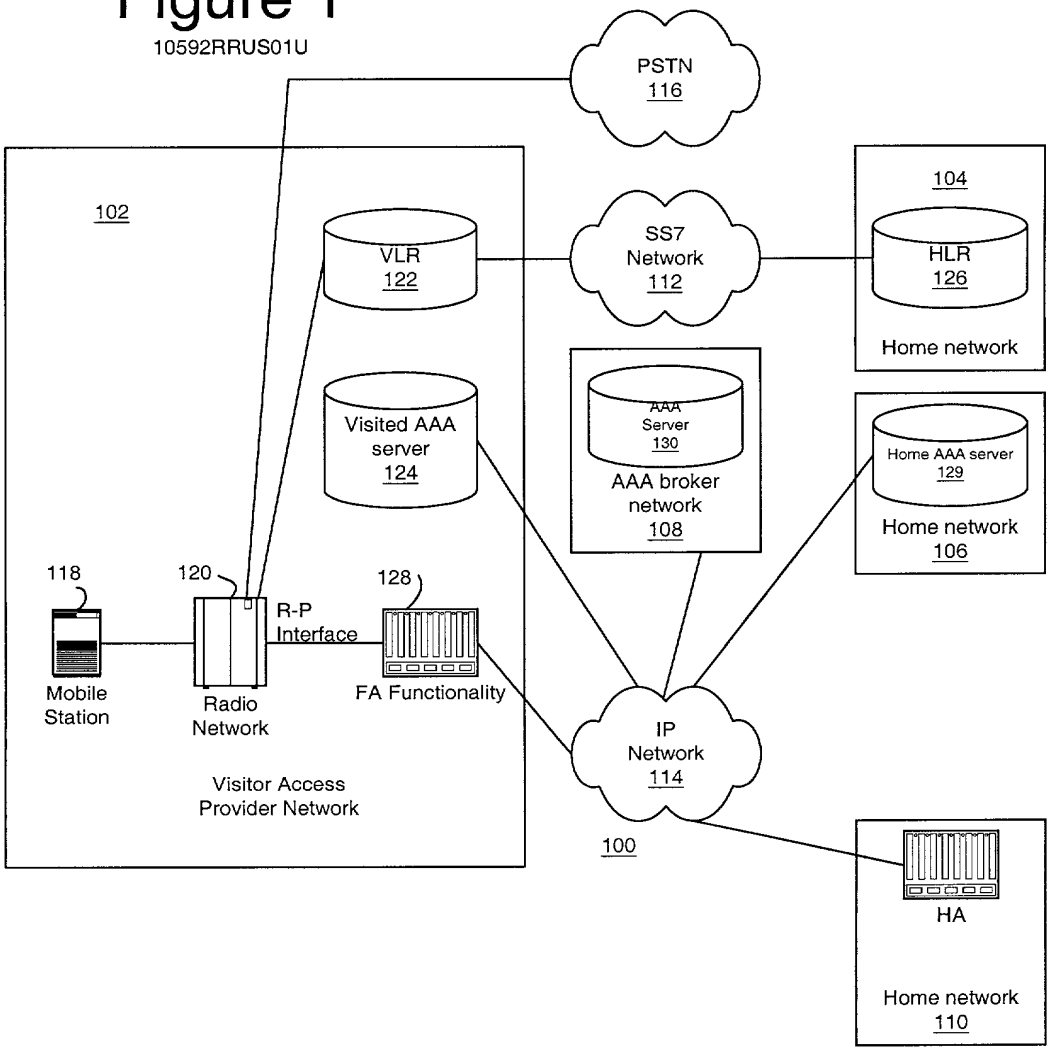


Figure 2

10592RRUS01U

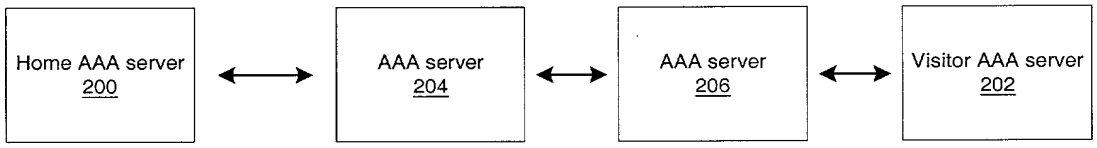


Figure 3

10592RRUS01U

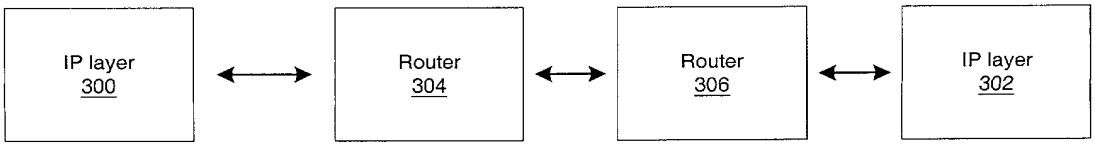
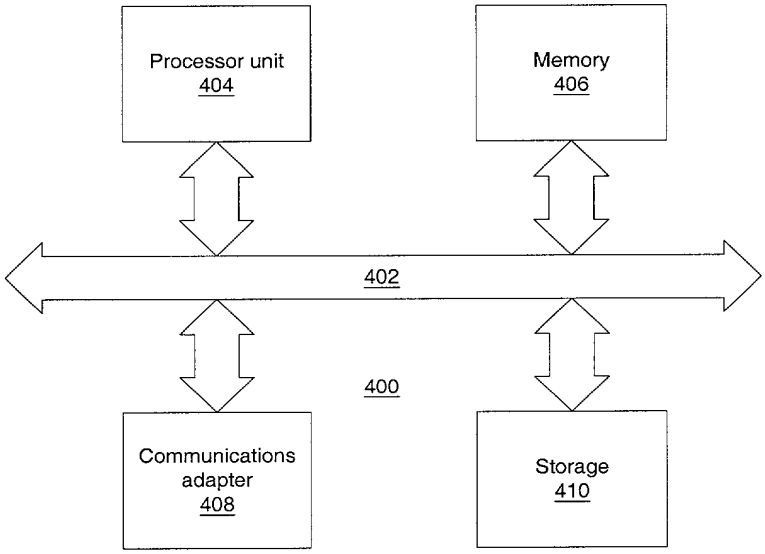


Figure 4
10592RRUS01U



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10592RRUS01U

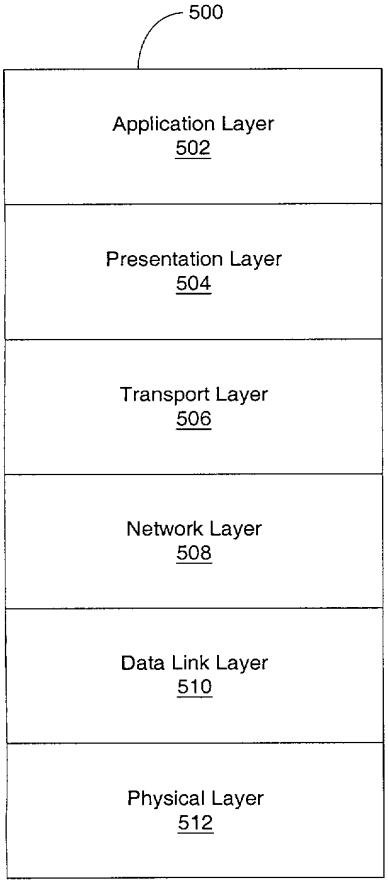

Figure 6
10592RRUS01U

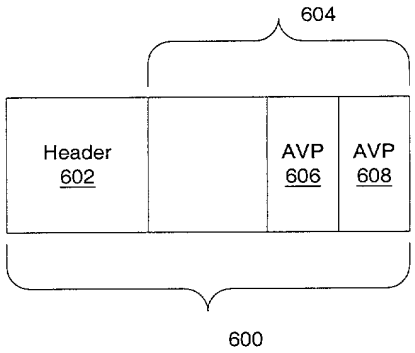

Figure 7
10592RRUS01U

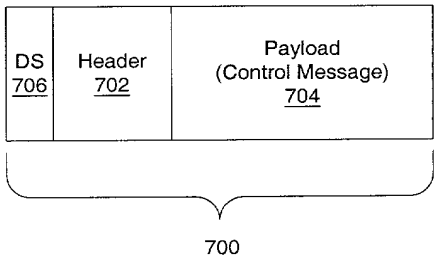

Figure 8

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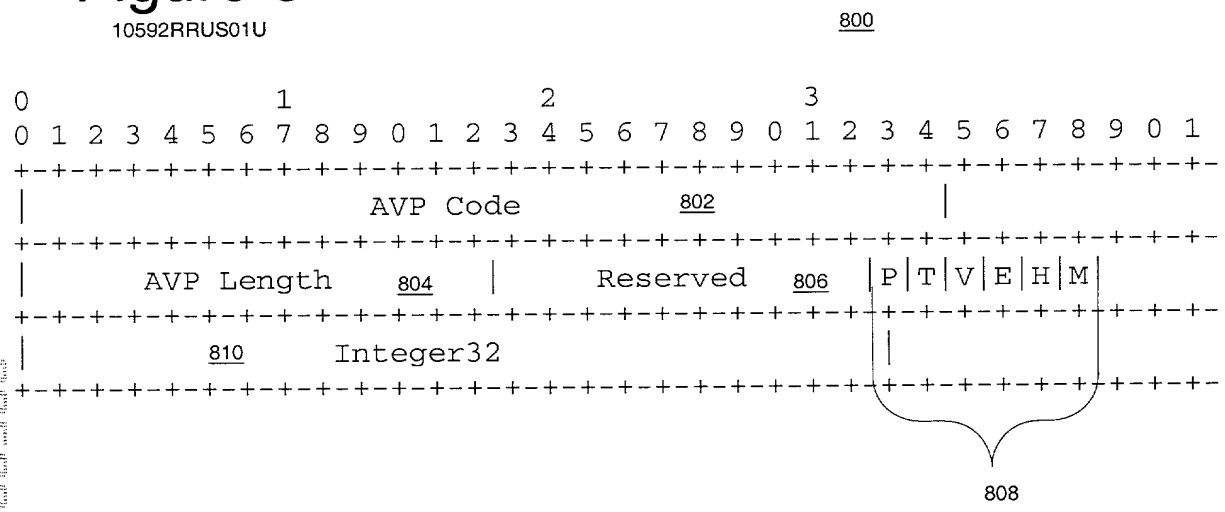

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Figure 9

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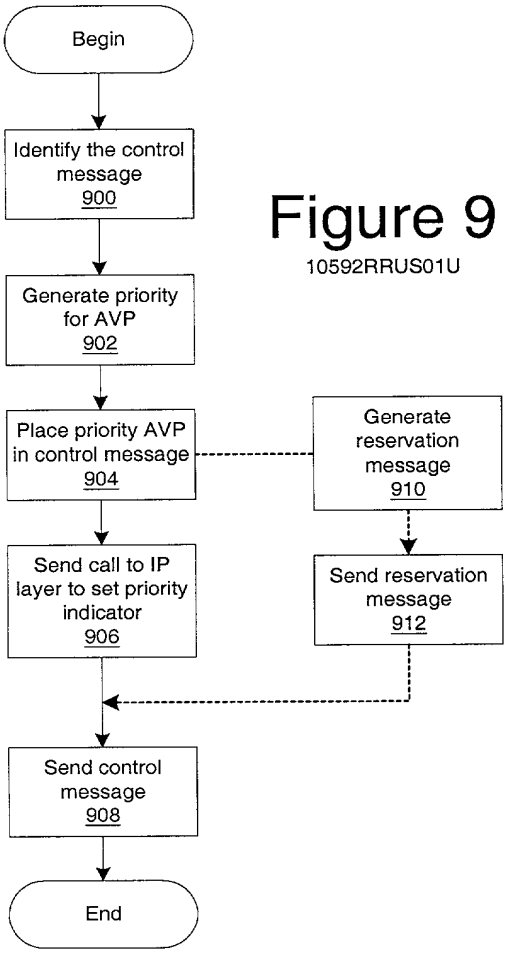
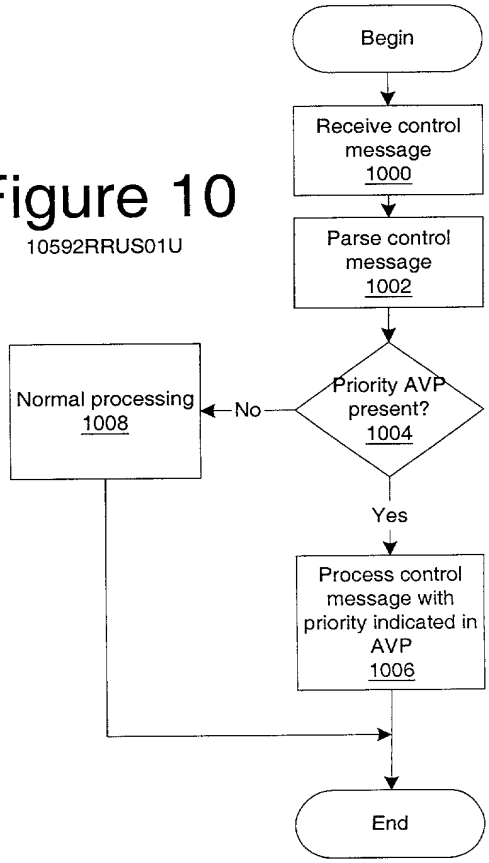


Figure 10

10592RRUS01U



DECLARATION AND POWER OF ATTORNEY FOR PATENT APPLICATION

As below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name;

I believe that I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled as set forth below, which is described in the specification of which: (check one)

X is filed herewith
under Attorney's Docket Number **10592RRUS01U**

METHOD AND APPARATUS FOR PROCESSING CONTROL MESSAGES IN A COMMUNICATIONS SYSTEM

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to the patentability of this application in accordance with 37 CFR 1.56.

I hereby claim the benefit under Title 35 United States Code section 120 of the provisional application filed under 111b of this title as listed below:

Application No. filed on .

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine of imprisonment, or both, under 18 USC 1001 and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

POWER OF ATTORNEY: As a named inventor, I hereby appoint the following attorneys and/or agents to prosecute this application and transact all business in the Patent and Trademark Office connected therewith.

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James A. Harrison, Reg. No. 40,401; W. Glen Johnson, Reg. No. 39,525; Duke W. Yee, Reg. No. 34,285;
Stephen R. Loe, Reg. No. 43,757; Stephen J. Walder, Jr., Reg. No. 41,534; Charles D. Stepps, Jr., Reg. No. 45,880; and Stephen R. Tkacs, Reg. No. P-46,430.

Send correspondence to Duke W. Yee, Carstens, Yee & Cahoon, LLP, PO Box 802334, Dallas, TX, 75380 and direct all telephone calls to Duke W. Yee, telephone: 972/367-2001.

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